ASSOCIATED GEOTECHNICAL ENGINEERS

CONSULTANTS FOR:

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EARTHQUAKE ENGINEERING • SPECIAL STUDY & RESEARCH
ENGINEERING GEOLOGY

1440 Koll Circle, Suite 106 • San Jose, California 95112
Telephone: (408) 998-3171

October 11, 1983
Project 211-2, SJ-4462

Santa Clara Valley Water District
5750 Almaden Expressway
San Jose, California 95118

Attention: Mr. Robert E. Tepel
Engineering Geologist
Water Facilities Branch

RE: GEOTECHNICAL ENGINEERING EVALUATION
OF PROPOSED BORROW MATERIALS
PAGE PERCOLATION POND
VICINITY OF SUNNYOAKS AND
HACIENDA AVENUES AND SOUTH
WINCHESTER BOULEVARD
CAMPBELL, CALIFORNIA

Gentlemen:

In accordance with your authorization (Purchase Order No. 32771), we have performed a geotechnical engineering evaluation of the materials that are to be removed from the above noted series of eight adjoining percolation ponds. We understand that the percolation rates for these ponds has declined appreciably in recent years. An earlier District study identified the fact that the pond bottom materials have become contaminated with noticeable amounts of silt and clay fines as well as some organic deposits. Since the silt and clay fines have concentrated predominately within roughly the upper 2 feet of the pond bottom materials, it is planned to carefully excavate the upper 2 feet of granular natural deposits to restore the percolation efficienty of the pond system.

The purpose of this study was to identify the general engineering properties of these materials and thereby allow an evaluation to be made of their suitability for use as fill materials, in various types of construction.

FINDINGS

A surface reconnaissance and subsurface exploration program were conducted on September 28, 1983, using a backhoe to explore the subsurface materials in the pond bottoms. A total of twenty-six exploratory pits were made at the approximate locations shown on the Site Plans, Figures 1 and 2, to depths between approximately 20 and 33 inches below the existing pond bottoms. The ibject ponds are identified as Pond Nos. 1 through 8 in accordance with the istrict's numbering system. Details regarding the field investigation and a

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description of the materials encountered in each of the pits are included in Appendix A. Results of the laboratory tests are presented in Appendix B.

A. Surface Conditions of Pond Bottoms

The eight percolation ponds investigated are located in two parcels, namely north of Hacienda Avenue (Pond Nos. 2 through 8) and south of Hacienda Avenue (Pond No. 1). At the time of our investigation, Pond Nos. 4 through 8 were dry while Pond Nos. 1 through 3 still contained 1 foot or more of water. The existing ponds typically have interior side slopes inclined at approximately 2 horizontal to 1 vertical. A thin (roughly 1/16 to 1/8 inch) coating of dried algae is typically found concentrated on the upper portion of the normally inundated pond side slopes. However, a more extensive algae deposit was noted covering the bottom of Pond No. 7 as well as in portions of Pond No. 6. It is considered likely that the three flooded ponds will also have a substantial algae deposit once they are completely dry. The dried algae only loosely adheres to the sand and gravel on the pond bottoms.

Pond Nos. 5 and 6 have a sparse weed growth in the bottoms. The typical weed consists of a single stalk roughly 8 to 18 inches in height. Pond Nos. 4, 7, and 8 contained very little vegetation.

B. Subsurface Conditions

Based upon our examination of the materials encountered in the exploratory pits as well as the materials exposed on the pond bottoms, the upper 2 feet of soils in the pond bottoms, consist predominately of sandy gravel with varying amounts of silty and clayey fines of low plasticity along with scattered cobbles, generally between 4 and 10 inches in maximum dimension, and local boulders up to 17 inches in maximum size. The bottom of Pond No. 1 is covered with an approximately 4 to 6 inch layer of organic silts and plastic clays which have very low permeabilities. Hence, this deposit is considered the primary reason why this pond still contains water. Although we have not been able to investigate and obtain samples in Pond Nos. 2 and 3 which also contain water, it is our opinion that similar, relatively impervious, surficial deposits will be exposed on these pond bottoms when they eventually dry. Detailed descriptions of the materials encountered in each of the exploratory pits are presented on Table A-1 in Appendix A.

CONCLUSIONS AND RECOMMENDATIONS

A. General Engineered Fill

Based on our observations and the test data in Appendix B, it is our opinion that the sandy gravel materials are well suited for use as general fill materials for placement beneath proposed building areas or pavements. We estimate that the percentage of fines in the natural sandy gravel deposits is in the range of 3 to 5 percent on the low end to a maximum of roughly 10 to 15 percent. The samples selected for testing ranged between roughly 5 and 10

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percent. The Atterberg Limits testing performed on a sample with approximately 10 percent fines indicates that the fines are composed of both silts and clays but they are typically present in such small amounts that they would not adversely affect the suitability of the material for general fill purposes. Similarly, the "R" Value testing suggests that the materials range in "R" Value from a low of roughly 30 to possibly as high as 60. The samples selected for testing had "R" Values of 37 and 57.

1. Structure Backfill

The sandy gravel materials comply with the gradation requirements for structure backfill under both the City of San Jose Specifications (Section P154-3.2) and Caltrans Specifications (Section 19-3.06) provided that the materials greater than 3 inches in maximum size are removed.

2. Trench Backfill

If the aggregate over roughly 3 to 4 inches in maximum dimension is removed, the sandy gravel would be well suited for use as trench backfill above the typical pipe bedding sand material in relatively narrow trenches where light weight compaction equipment must be used. On larger trench installations, where self-propelled compaction equipment can be used, the need for screening off oversize aggregate would not be as critical.

3. Pavements

The materials would need a substantial amount of processing to consistently comply with the gradation requirements, "R" Values and portion of crushed particles required for aggregate base and subbase materials. However, the material could be used beneath a pavement section and with its moderately high "R" Value, it would be possible to reduce the thickness of the aggregate base or subbase sections that would be placed above it. In addition, the material is ideally suited for use on unpaved gravel roads, maintenance yards, etc. where oversize material could be readily bladed off to the side.

4. Permeable Material

The materials generally contain too many silt and clay fines to comply with the stringent requirements for Permeable Material under the Caltrans Specifications (Section 68-1.025).

5. Embankment Fill

The material would be well suited for typical roadway embankment fills. Please refer to the preceding discussion for General Engineered Fill.

6. Levee Fill

The materials do not contain a sufficient amount of fines to be considered for use as an impervious levee fill. However, they could be utilized in a zoned type embankment if it is large enough to allow placement of both an impervious fill and a granular fill. In addition, they could be utilized for a gravel surface road and/or an erosion resistant covering along the top of a levee.

7. Topsoil

The 4 to 6- inch thick layer of organic silt and plastic clay deposits encountered on the surface in Pond No. 1 and likely to be encountered in Pond Nos. 2 and 3 should be carefully removed before excavating the underlying sandy gravel deposits. This silt and clay soil appears to contain an abundance of nutrients and should make an excellent topsoil for use in landscape areas.

B. Excavation

We understand that the District will excavate the 2 feet of materials with a hydraulic excavator, Gradall or similar piece of equipment that can avoid disturbing the underlying natural deposits. With this equipment, it will be possible to strip areas with particularly heavy concentrations of algae or weed growth without wasting much of the underlying sandy gravel. Similarly, the layer of organic silts and plastic clays in Pond Nos. 1, 2 and 3 can also be carefully removed without contaminating the underlying materials.

We thank you for this opportunity to be of service. If you have any questions regarding our findings, please call.

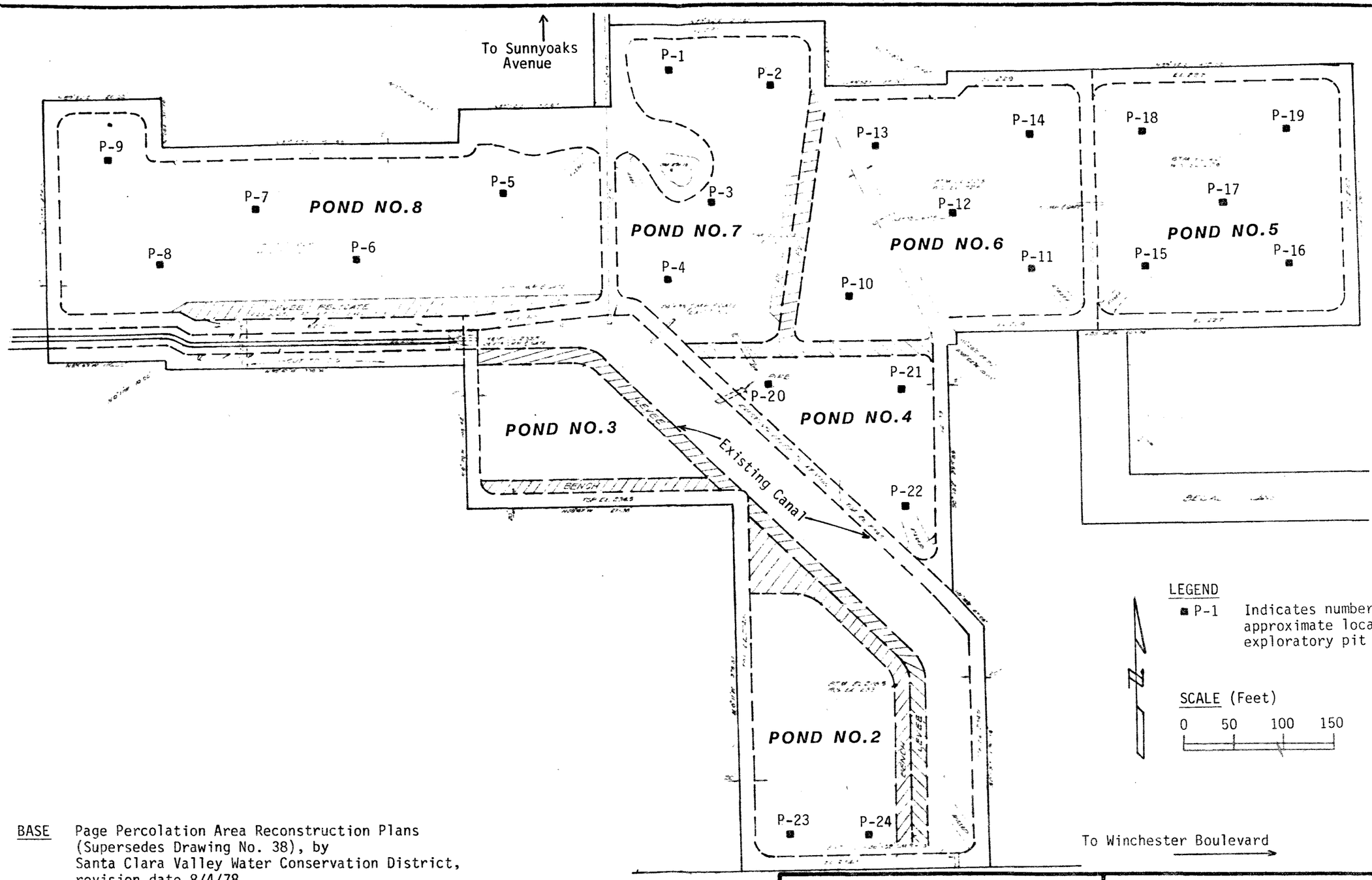
Very truly yours,

ASSOCIATED GEOTECHNICAL ENGINEERS, INC.

John W. Leonard
R.E. C19182

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Copies: Addressee (5)



BASE Page Percolation Area Reconstruction Plans (Supersedes Drawing No. 38), by Santa Clara Valley Water Conservation District, revision date 8/4/78.

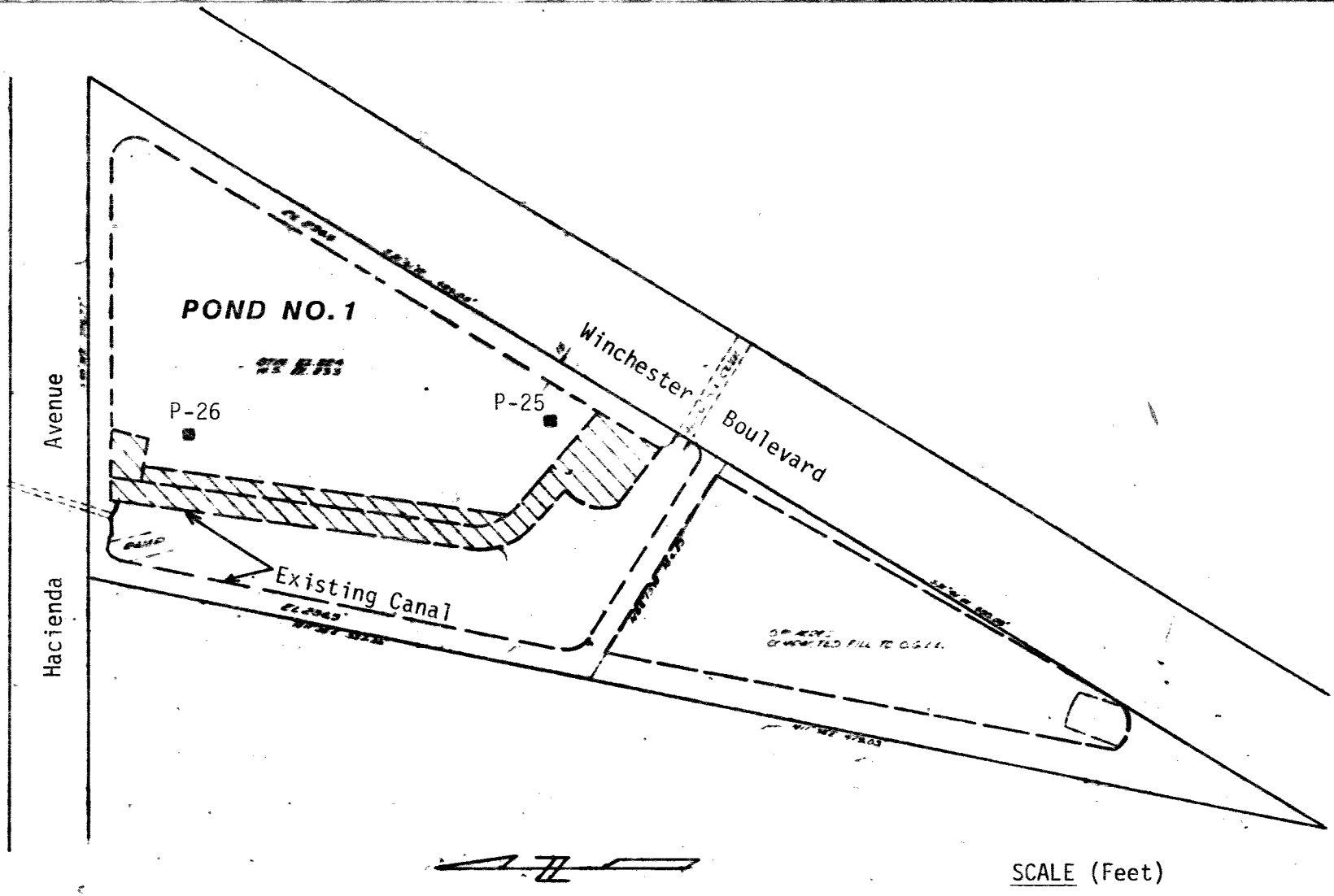
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SITE PLAN

PAGE PERCOLATION PONDS
CAMPBELL, CALIFORNIA

PROJECT	DATE	FIGURE
211-2	October 1983	1



LEGEND

■ P-25 Indicates number and approximate location of exploratory pit

BASE Page Percolation Area Reconstruction Plans (Supersedes Drawing No. 38), by Santa Clara Valley Water Conservation District, revision date 8/4/78.

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SITE PLAN

PAGE PERCOLATION PONDS
CAMPBELL, CALIFORNIA

Project	Date	FIGURE
211-2	Oct. 1983	2

APPENDIX A - FIELD INVESTIGATION

The field investigation consisted of a surface reconnaissance and a subsurface exploration program performed on September 28, 1983, using a backhoe to explore the subsurface materials. A total of twenty-six exploratory pits were made at the approximate locations shown on the Site Plans, Figures 1 and 2 to maximum depths between roughly 20 and 33 inches. The exploratory pits were backfilled upon completion of the exploratory work.

The soils encountered in the exploratory pits were logged in the field by our representative and described in accordance with the Unified Soil classification System (ASTM D-2487). The descriptions of materials encountered in the pits is presented on Table A-1. A key for the classification of the soils is included as part of this appendix on Figure A-1.

Representative soil samples were obtained from selected exploratory pits. All samples were taken to our laboratory for further evaluation and testing.

The soil descriptions presented on Table A-1 are based upon our interpretation of the subsurface conditions on the date and at the locations indicated, and it is not warranted that they are representative of subsurface conditions at other locations and times.

PRIMARY DIVISIONS			Group Symbol	SECONDARY DIVISIONS
COARSE GRAINED SOILS more than half of material is larger than No. 200 sieve size	GRAVELS more than half of coarse fraction is larger than No. 4 sieve	Clean Gravels (less than 5% fines)	GW	well graded gravels, gravel-sand mixtures, little or no fines.
			GP	poorly graded gravels or gravel-sand mixtures, little or no fines.
		Gravel with fines	GM	silty gravels, gravel-sand-silt mixtures, non-plastic fines.
			GC	clayey gravels, gravel-sand-clay mixtures, plastic fines.
	SANDS more than half of coarse fraction is smaller than No. 4 sieve	Clean Sands (less than 5% fines)	SW	well graded sands, gravelly sands, little or no fines.
			SP	poorly graded sands or gravelly sands, little or no fines.
		Sands with fines	SM	silty sands, sand-silt mixtures, non-plastic fines.
			SC	clayey sands, sand-clay mixtures, plastic fines.
FINE GRAINED SOILS more than half of material is smaller than No. 200 sieve size	SILTS AND CLAYS liquid limit is less than 50%		ML	inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.
			CL	inorganic clays of low to medium plasticity gravelly clays, sandy clays, silty clays, lean clays.
			OL	organic silts and organic clays of low plasticity.
	SILTS AND CLAYS liquid limits is greater than 50%		MH	inorganic silts, micaceous or disomaceous fine sandy or silty soils, elastic.
			CH	inorganic clays of high plasticity, fat clays.
HIGHLY ORGANIC SOILS			PT	peat and other highly organic soils.

DEFINITION OF TERMS

U.S. Standard Series Sieve: 200 | 40 | 10 | 4 | Clear Square Sieve Openings: 3/4" | 3" | 12"

SILTS & CLAYS	SAND			GRAVEL		COBBLE	BOULDER
	fine	medium	coarse	fine	coarse		

GRAIN SIZES

SANDS, GRAVELS, AND NON-PLASTIC SILTS	STANDARD PENETRATION Blows/Ft.
very loose	0- 4
loose	4-10
medium dense	10-30
dense	30-50
very dense	over 50

RELATIVE DENSITY

PLASTIC SILTS AND CLAYS	Unconfined Compressive Strength tons/sq. ft.	STANDARD PENETRATION Blows/ft.
very soft	0 - 1/4	0 - 2
soft	1/4 - 1/2	2 - 4
firm	1/2 - 1	4 - 8
stiff	1 - 2	8-16
very stiff	2 - 4	16-32
hard	over 4	over 32

CONSISTENCY

ASSOCIATED GEOTECHNICAL ENGINEERS, INC.

San Jose, California

KEY TO EXPLORATORY BORING LOGS
Unified Soil Classification System (ASTM D-2487)

PAGE PERCOLATION PONDS
CAMPBELL, CALIFORNIA

Project No.	Date
211-2	October 1983

FIGURE A - 1

TABLE A-1 - DESCRIPTION OF SOILS ENCOUNTERED IN THE EXPLORATORY PITS

Pit No.	Depth(ft.)	Description	USCS
P-1	0-1.83	SANDY GRAVEL, brown, with fine to coarse grained sands and gravels, silty and clayey fines, and cobbles up to 8 inches in maximum size	GW/GC/GM
P-2	0-2	SANDY GRAVEL, brown, with fine to coarse grained sands and gravels, silty and clayey fines, and cobbles up to 10 inches maximum size	GW/GC/GM
P-3	0-1.67	SANDY GRAVEL, brown, with fine to coarse grained sands and gravels, silty and clayey fines, cobbles, and local boulders up to 13 inches in maximum size	GW/GC/GM
P-4	0-1.67	SANDY GRAVEL, brown, with fine to coarse grained sands and gravels, silty and clayey fines, and cobbles up to 8 inches in maximum size	GW/GC/GM
P-5	0-2.33	SANDY GRAVEL, brown, with fine to coarse grained sands and gravels, silty and clayey fines, and cobbles up to 7 inches in maximum size	GW/GC/GM
P-6	0-2.1	SANDY GRAVEL, brown, with fine to coarse grained sands and gravels, silty and clayey fines, and cobbles up to 5 inches in maximum size	GW/GC/GM
P-7	0-2.33	SANDY GRAVEL, brown, with fine to coarse grained sands and gravels, local pockets of silty clays, and cobbles up to 6 inches in maximum size	GW/GC
P-8	0-2.58	SANDY GRAVEL, brown, with fine to coarse grained sands and gravels, local pockets of silty clays, and cobbles up to 6 inches in maximum size	GW/GC
P-9	0-2.75	SANDY GRAVEL, brown, with fine to coarse grained sands and gravels, local pockets of silty clays, and cobbles up to 6 inches in maximum size	GW/GC

TABLE A-1 - DESCRIPTION OF SOILS ENCOUNTERED IN THE EXPLORATORY PITS

Pit No.	Depth(ft.)	Description	USCS
P-10	0-2	SANDY GRAVEL, brown, with fine to coarse grained sands and gravels, local pockets of silty clays, and cobbles up to 8 inches in maximum size	GW/GC
P-11	0-2	SANDY GRAVEL, brown, with fine to coarse grained sands and gravels, local pockets of silty clays, cobbles, and boulders up to 17 inches in maximum size	GW/GC
P-12	0-2	SANDY GRAVEL, brown, with fine to coarse grained sands and gravels, local pockets of silty clays, and cobbles up to 6 inches in maximum size	GW/GC
P-13	0-2.42	SANDY GRAVEL, brown, with fine to coarse grained sands and gravels, clayey fines, and cobbles up to 12 inches in maximum size	GW/GC
P-14	0-2.17	SANDY GRAVEL, brown, with fine to coarse grained sands and gravels, local pockets of silty clays, and cobbles up to 8 inches in maximum size	GW/GC
P-15	0-2	SANDY GRAVEL, brown, with fine to coarse grained sands and gravels, silty and clayey fines, and cobbles up to 7 inches in maximum size	GW/GP/GC/GM
P-16	0-2.42	SANDY GRAVEL, brown, with fine to coarse grained sands and gravels, silty and clayey fines, and cobbles up to 6 inches in maximum size	GW/GP/GC/GM
P-17	0-2.5	SANDY GRAVEL, brown, with fine to coarse grained sands and gravels, silty and clayey fines, and cobbles up to 7 inches in maximum size	GW/GP/GC/GM

TABLE A-1 - DESCRIPTION OF SOILS ENCOUNTERED IN THE EXPLORATORY PITS

Pit No.	Depth(ft.)	Description	USCS
P-18	0-2	SANDY GRAVEL, brown, with fine to coarse grained sands and gravels, silty and clayey fines, and cobbles up to 7 inches in maximum size	GW/GP/GC/GM
P-19	0-2.33	SANDY GRAVEL, brown, with fine to coarse grained sands and gravels, silty and clayey fines, and cobbles up to 11 inches in maximum size	GW/GP/GC/GM
P-20	0-2	SANDY GRAVEL, brown, with fine to coarse grained sands and gravels, silty and clayey fines, cobbles, and local boulders up to 13 inches in maximum size	GW/GC/GM
P-21	0-2.1	SANDY GRAVEL, brown, with fine to coarse grained sands and gravels, local pockets of sandy clay, and cobbles up to 4 inches in maximum size	GW/GC
P-22	0-2	SANDY GRAVEL, brown, with fine to coarse grained sands and gravels, local pockets of silty clays, and cobbles up to 6 inches in maximum size	GW/GC
P-23	0-2.17	SANDY GRAVEL, brown, with fine to coarse grained sands and gravels, clayey fines, and cobbles up to 4 inches in maximum size	GW/GC
P-24	0-2	SANDY GRAVEL, brown, with fine to coarse grained sands and gravels, local pockets of sandy clay, and cobbles up to 4 inches in maximum size	GW/GC
P-25	0-2.5	SANDY GRAVEL, brown, with fine to coarse grained sands and gravels, some silty fines, cobbles, and boulders up to 18 inches in maximum size	GW/GM

TABLE A-1 - DESCRIPTION OF SOILS ENCOUNTERED IN THE EXPLORATORY PITS

Pit No.	Depth(ft.)	Description	USCS
P-26	0-0.5	SILTY CLAY, dark brown to grey, medium to high plasticity, with fine grained sand	OH-MH
	0.5-2	SANDY GRAVEL, brown, with fine to coarse grained sands and gravels, clayey fines, and cobbles up to 5 inches in maximum size	GW/GC

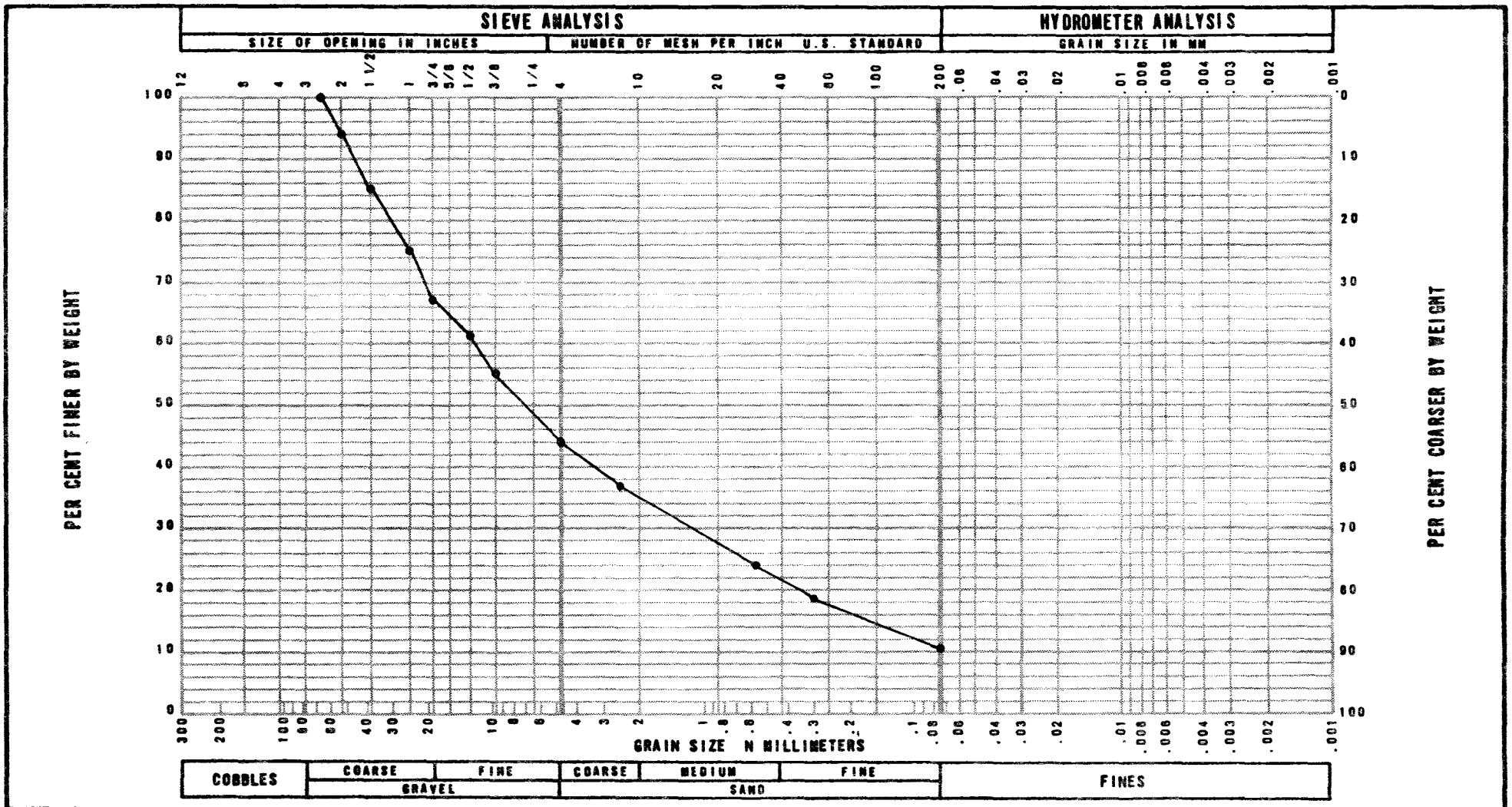
APPENDIX B - LABORATORY TESTING

The laboratory testing program was directed toward a qualitative evaluation of the physical and engineering properties of the upper 2 feet of soils in the pond bottoms to evaluate these materials for use as general fill material in various types of earthwork projects.

Five grain size analysis tests were performed on selected samples of the soil materials to aid in classification of these materials. The results of the tests are presented on Figures B-1 through B-5.

Two "R"-Value tests were performed on representative bulk samples of the soil materials. The results of the tests are presented on Figures B-6 and B-7.

Two Atterberg Limit determination tests were performed on the soils to determine the ranges of moisture contents over which the soils exhibit plasticity and to classify the soils according to the Unified Soil Classification System, USCS, (Figure A-1). The plasticity characteristics of the soil also provide an indication of the soils expansion potential. The results of these tests are presented on Figure B-8.



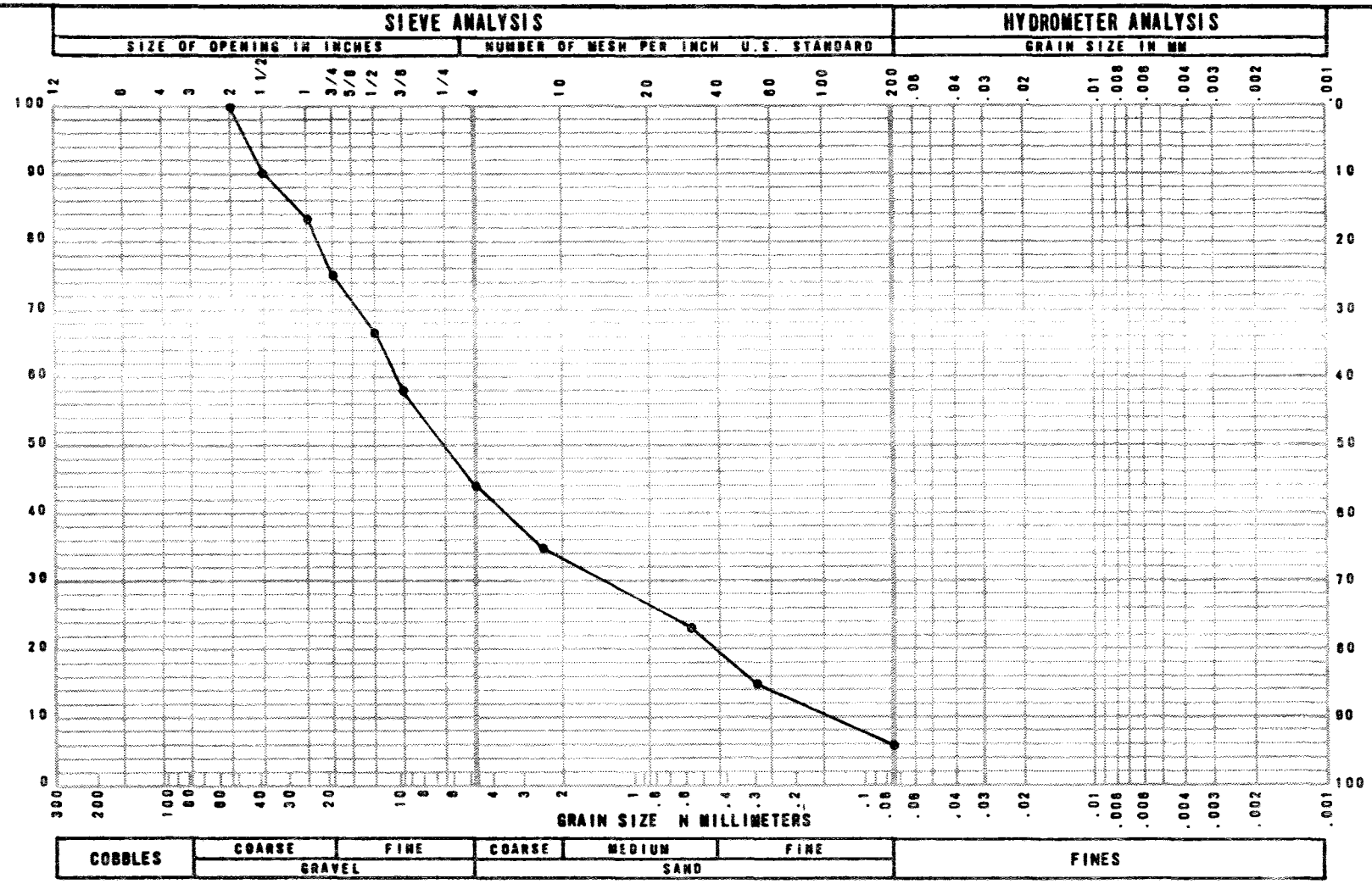
SAMPLE NO.	DEPTH-FT.	U.S.C.	CLASSIFICATION	NAT. W.C. %	LL	PL	PI
P-1	0-2	GW/GM	SANDY GRAVEL with silty and clayey fines	-	-	-	-

GRAIN SIZE CLASSIFICATION

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Project 211-2 FIG. B-1



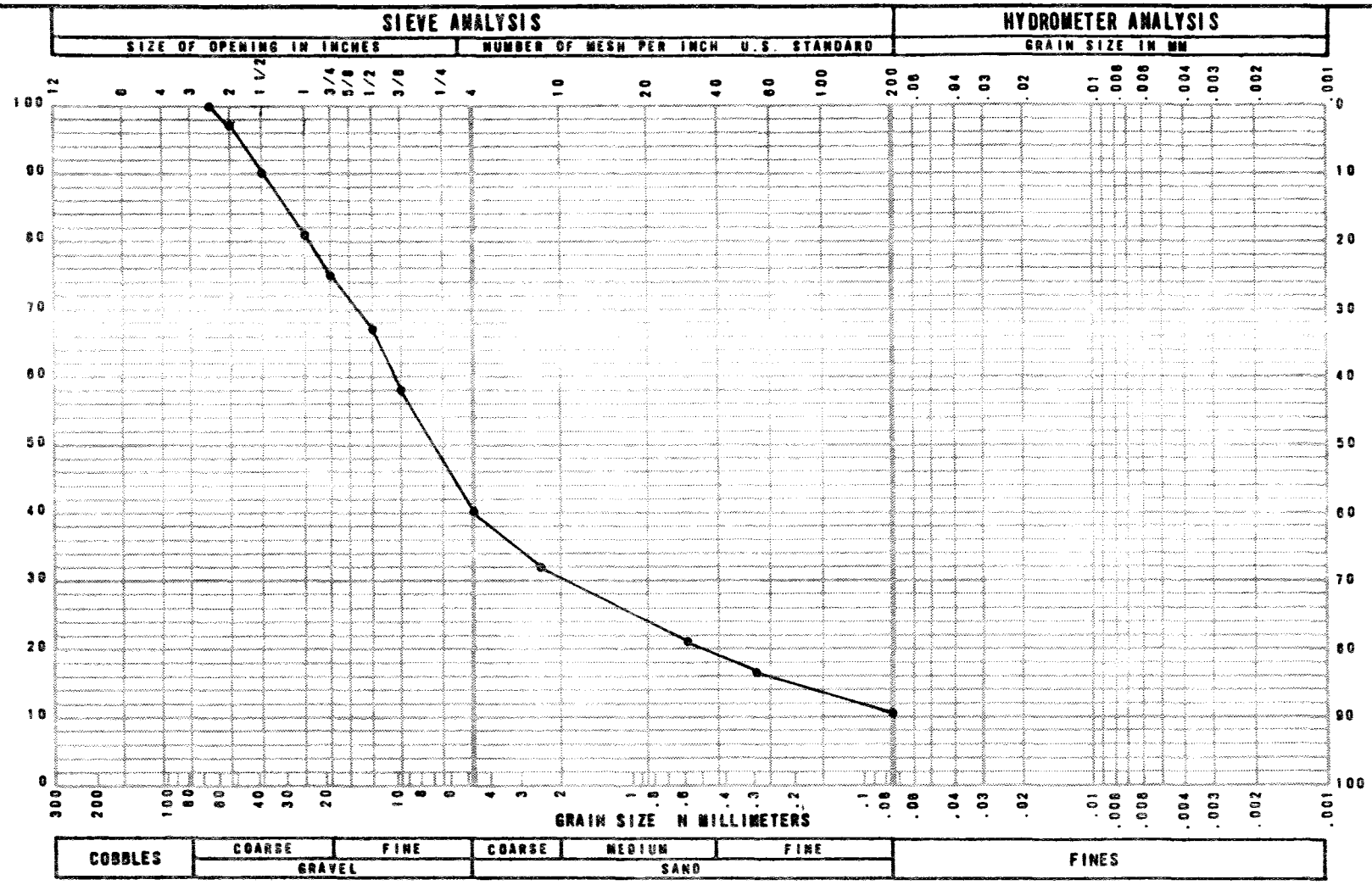
SAMPLE NO.	DEPTH-FT.	U.S.C.	CLASSIFICATION	NAT. W.C. %	LL	PL	PI
P-8	0-1	GW/GM	SANDY GRAVEL with some silty clay	-	-	-	-

GRAIN SIZE CLASSIFICATION

ASSOCIATED GEOTECHNICAL ENGINEERS, INC.

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Project 211-2 FIG. B-2



SAMPLE NO.	DEPTH-FT.	U.S.C.	CLASSIFICATION	NAT. W.C. %	LL	PL	PI
P-17	1-2	GP/GC	SANDY GRAVEL with silty and clayey fines	-	-	-	-

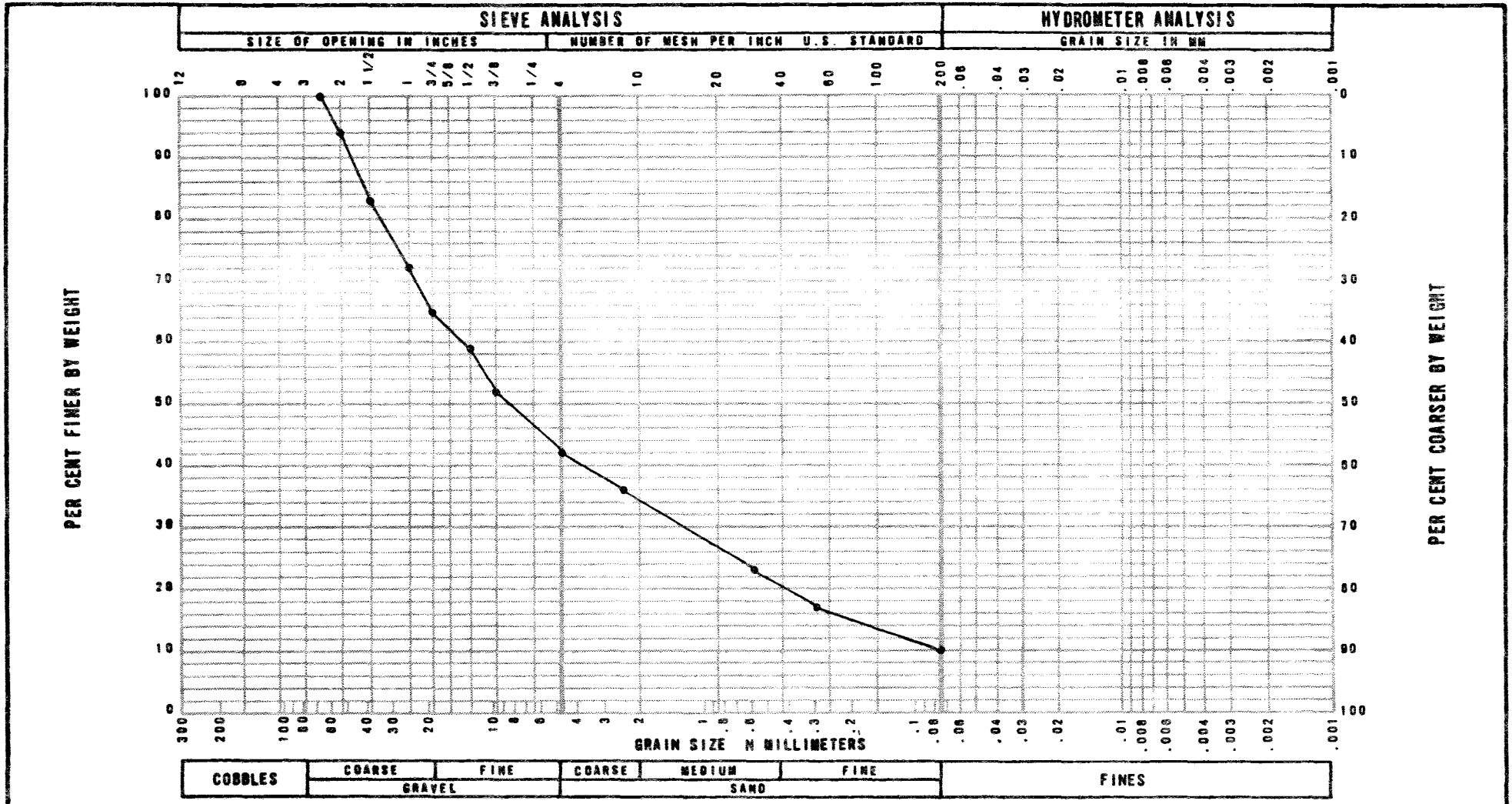
GRAIN SIZE CLASSIFICATION

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Project 211-2

FIG. B-3



SAMPLE NO.	DEPTH-FT.	U.S.C.	CLASSIFICATION	NAT. W.C. %	LL	PL	PI
P-20	0-1	GW/GM	SANDY GRAVEL with silty and clayey fines	-	-	-	-

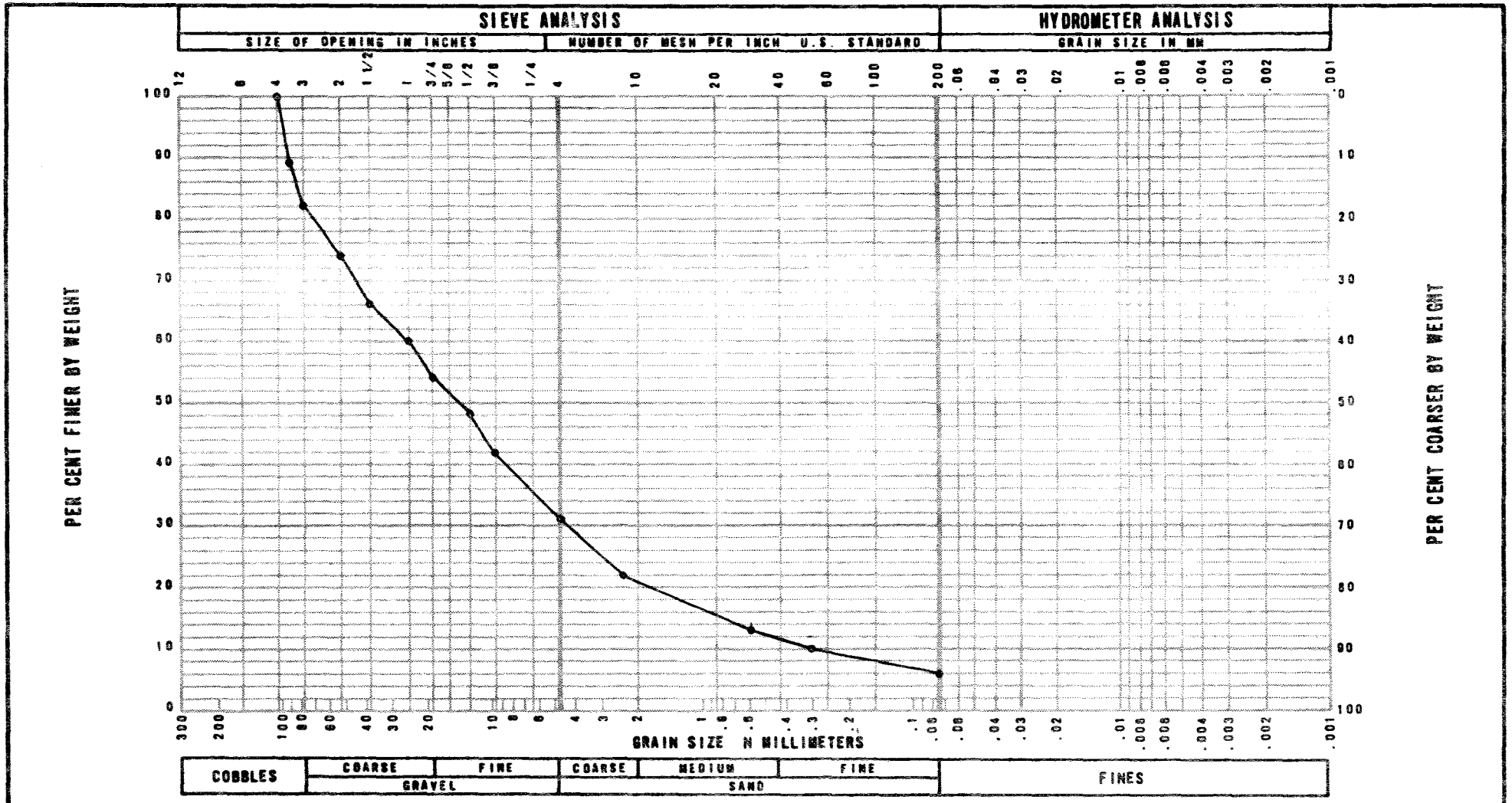
GRAIN SIZE CLASSIFICATION

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Project 211-2

FIG. B-4



SAMPLE NO.	DEPTH-FT.	U.S.C.	CLASSIFICATION	NAT. W.C. %	LL	PL	PI
P-25	0-1	GW/GM	SANDY GRAVEL with silty fines and cobbles	-	-	-	-

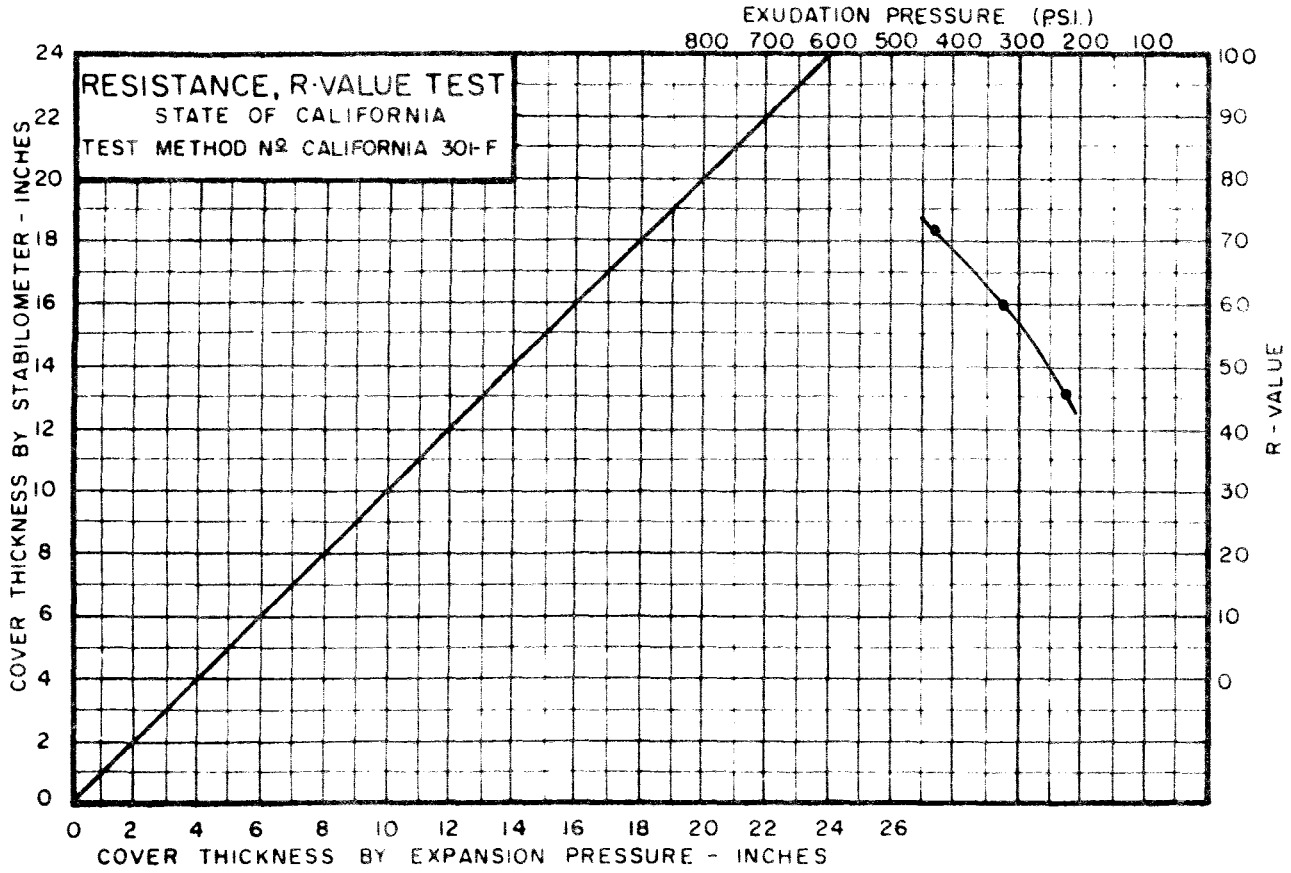
GRAIN SIZE CLASSIFICATION

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FIG. B-5



SAMPLE P-8, 0'-1'

DESCRIPTION Brown Sandy Gravel with some silty clay and cobbles

SPECIMEN	A	B	C
EXUDATION PRESSURE (PSI.)	218	326	433
EXPANSION DIAL (.0001")	0	8	15
EXPANSION PRESSURE (PSF)	0	35	65
RESISTANCE VALUE, "R"	46	60	72
% MOISTURE AT TEST	9	8	8
DRY DENSITY AT TEST (PCF)	134	135	136
"R" VALUE AT 300 PSI. EXUDATION PRESSURE	= (57)		

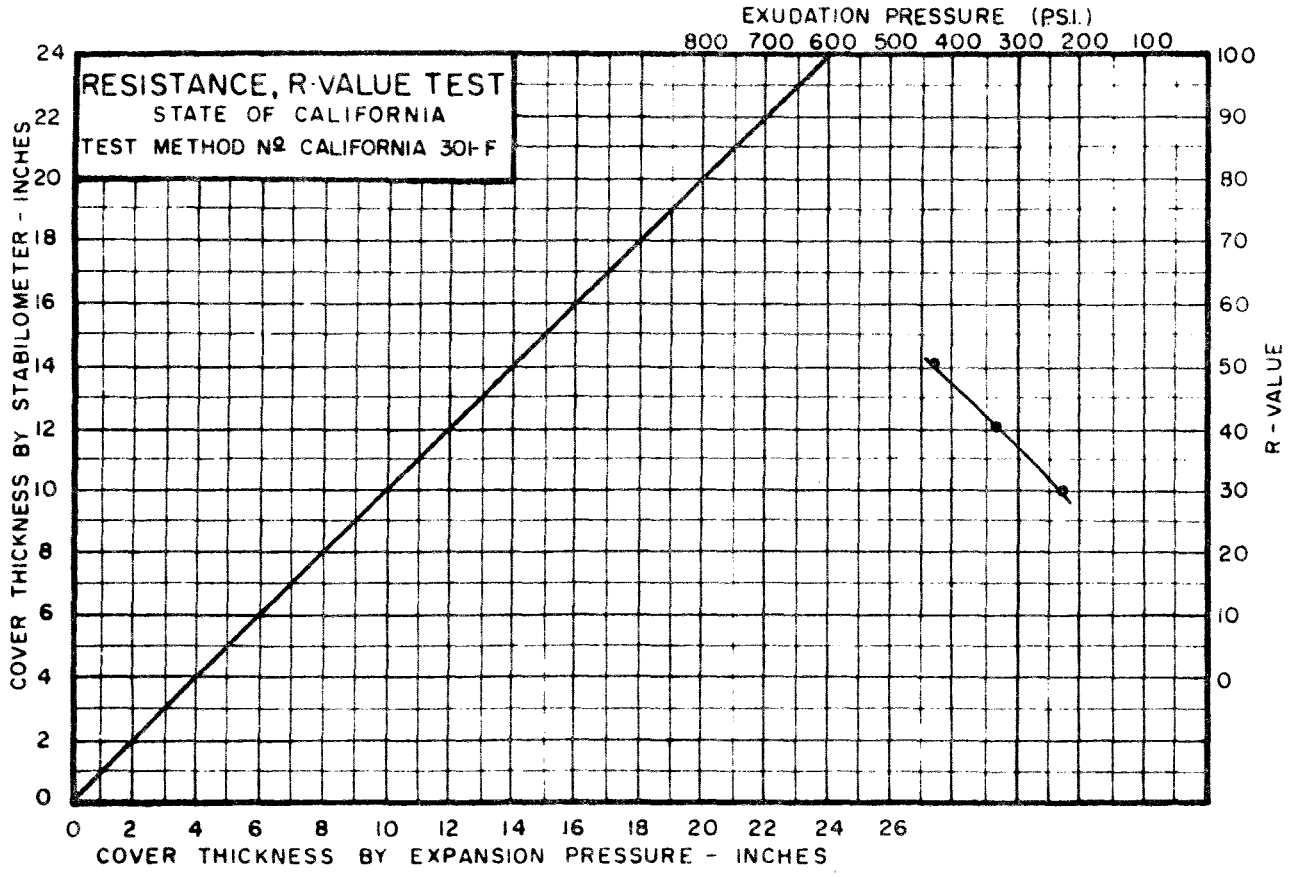
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" R " VALUE TEST RESULTS

PAGE PERCOLATION PONDS
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Project	Date	FIGURE B-6
211-2	October 1983	



SAMPLE P-17, 1'-2'

DESCRIPTION Brown Sandy Gravel with silty and clayey fines and cobbles

SPECIMEN	A	B	C
EXUDATION PRESSURE (P.S.I.)	232	328	423
EXPANSION DIAL (.0001")	10	18	26
EXPANSION PRESSURE (P.S.F.)	43	78	113
RESISTANCE VALUE, "R"	30	41	51
% MOISTURE AT TEST	10	9	9
DRY DENSITY AT TEST (P.C.F.)	131	132	134
"R" VALUE AT 300 P.S.I. EXUDATION PRESSURE	= (37)		

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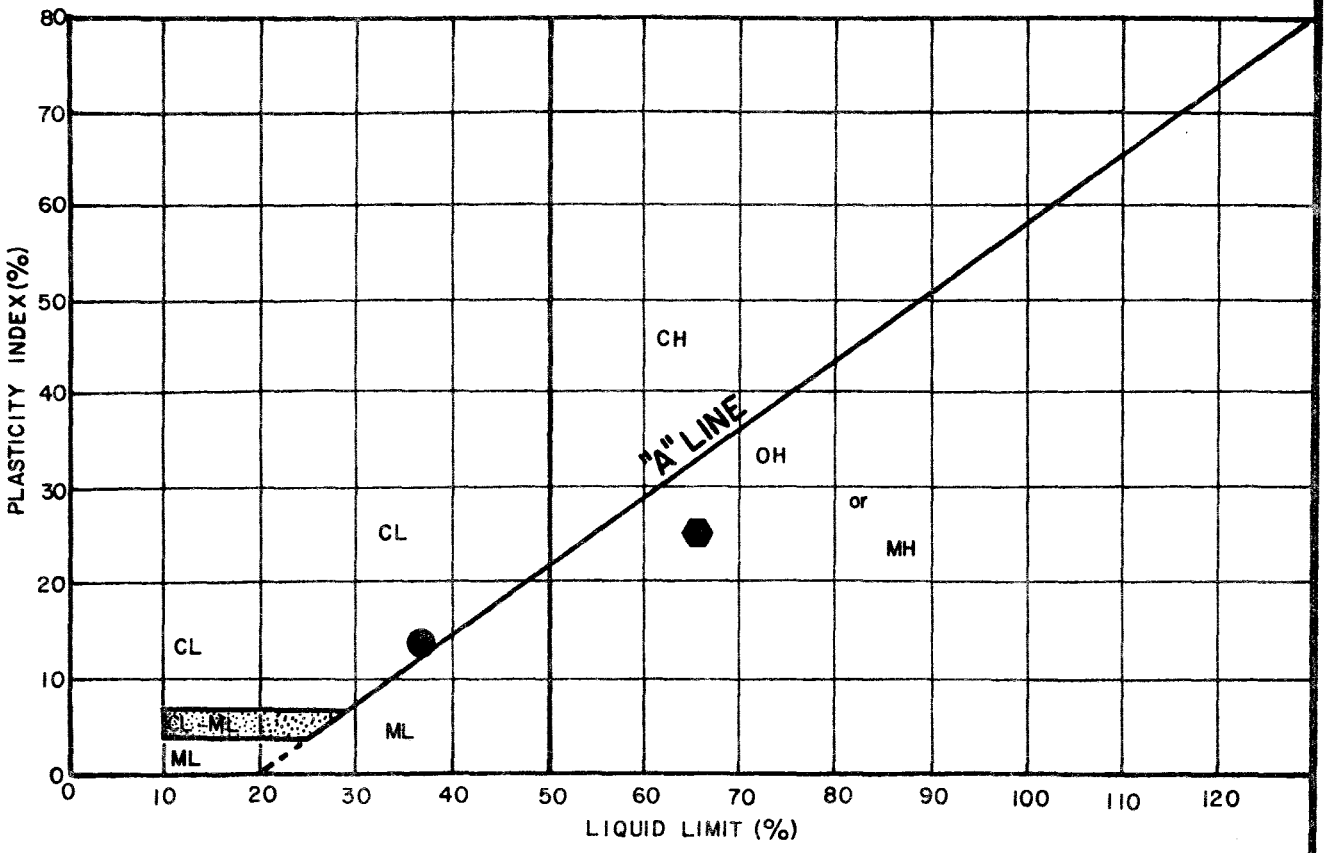
san jose, ca.

" R " VALUE TEST RESULTS

PAGE PERCOLATION PONDS
CAMPBELL, CALIFORNIA

Project	Date	FIGURE B-7
211-2	October 1983	

PLASTICITY CHART



PLASTICITY DATA

KEY SYMBOL	HOLE NUMBER	DEPTH (feet)	NATURAL WATER CONTENT W (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	LIQUIDITY INDEX $(\frac{W-PL}{LL-PL})$	UNIFIED SOIL CLASSIFICATION SYMBOL
●	P-1	0-2	--	24	37	13	--	CL-ML
⬢	P-26	0-½	--	41	66	25	--	OH-MH

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San Jose, California

PLASTICITY CHART AND DATA

PAGE PERCOLATION PONDS
CAMPBELL, CALIFORNIA

Project No.	Date	Page	FIGURE
211-2	October 1983	1 of 1	B-8